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THE LAMOTTE FALLING DROP DENSIOMETER FOR DETERMINING BLOOD PROTEINS AND SPECIFIC GRAVITY OF BODY FLUIDS

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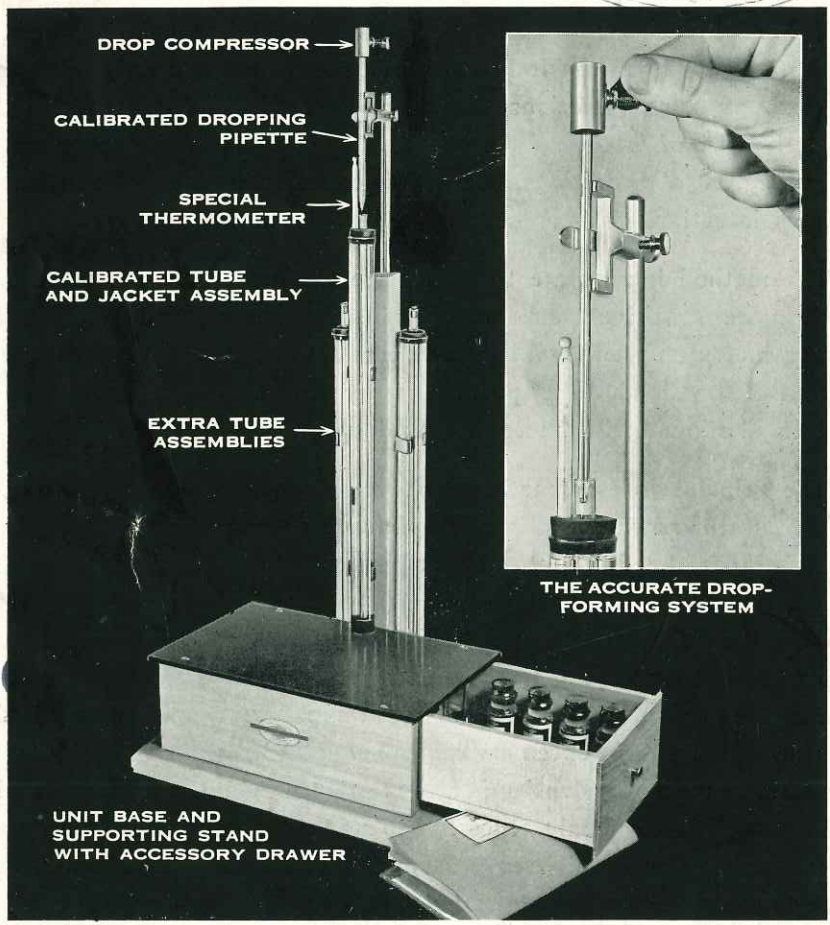
(Produced with the cooperation of H. G. Barbour of Yale University and W. F. Hamilton of University of Georgia and approved by them.)



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DISCUSSION

The advent of a method by which blood as well as plasma specific gravity changes can be followed from minute to minute, with single drops, opens a field of application to very acute shifts in the water balance, such as occur, for instance, in anesthetic and operative shock. One can also evaluate procedures designed to combat these conditions, such as the administration of drugs or alkalis. The method further permits following the administration of fluids, while actually being given, in various acute toxemias, the blood condition serving as a guide to the therapeutic procedure.

The administration of dextrose, acacia or saline solutions, or of transfused blood, can be followed in the treatment not only of shock, but also of such conditions as severe burns and heat stroke. The determination of water shifts also has applications in the toxemias of pregnancy, renal conditions, edemas, anemias, alimentary disturbances such as intestinal obstruction, and especially in neurology.

The method is accurate to 0.0001 specific gravity being, therefore, much more sensitive than hemoglobin estimations, red cell counts, refractometry or even total solids determinations in studying the water content of the blood. The specific gravity of one 10 cmm. drop of body fluid may be found within less than a minute.

The principle of the method involves timing the fall of a drop of body fluid of known size through a definite distance in a mixture non-miscible with the fluid. A standard solution of potassium sulfate of known density is the basis for the determination. The falling time through the XBB Mixture over a distance of 30 cm. is determined by a stop watch. By applying to an alignment chart, a ruler or taut thread against the proper falling time and bath temperature, one now reads the apparent density difference between the standard and the XBB Mixture. The fluid of unknown density is at once tested in the same way and its value read. It is now only necessary to subtract algebraically the standard apparent density difference from the unknown density difference and add the result to the standard K_2SO_4 solution density. This gives the specific gravity of the tested body fluid from which the protein content may be easily computed by means of a standard formula.

The photograph shows the "LaMotte Falling Drop Densiometer" in

position, ready for use. In its standard form the unit consists of the following parts and solutions:

Apparatus:

1. A substantial hard wood base with sliding accessory drawer and hard rubber top provided with a sturdy supporting device for holding the tubes and dropping apparatus in perfect alignment. Side clamps are attached for holding additional tube assemblies.
2. Three special tube assemblies, each consisting of:
   a. Outside glass jacket tube (WJ Tube) which serves as a water bath for the calibrated tube containing the XBB Mixture. This is affixed to the back of the support in a perpendicular position by means of two clamps.
   b. Special (FD) tube for holding the XBB Mixture. This tube of carefully controlled dimensions is accurately calibrated at equal distances from the two ends of the tube. The fall of the drop is timed by means of these graduations. The tube is held in place by two rubber fittings, the one at the top being perforated for a thermometer.

   The water jacket may be filled through the thermometer opening. The FD Tube is filled with the proper XBB Mixture and closed with a cork stopper when not in use.
3. Special, sensitive thermometer for determining the temperature of the water bath. Graduated from 15° to 35°C. in 0.5°C. intervals.
4. Adjustable clamp for holding the dropping pipette.
5. Dropping pipette. This is a special pipette made from unconstricted capillary tubing, calibrated to deliver between marks, exactly 10 cmm. The delivery end is ground to a conical point in such a way as to leave a narrow rim. Two such pipettes are supplied with the set.
6. A compression clamp of special design by means of which the measurement and delivery of the fluid can be carefully controlled.
7. One alignment chart.
8. Drawer compartment fitted with rack to hold the following solutions and compartment for storage of pipette, clamps, etc. The solutions supplied with this outfit are selected for use in determining the protein content of blood plasma and for specific gravity determinations of other body fluids.

9. **Solutions:**

XBB Mixtures and Solutions	Specific Gravity 20°C/20°C.	Uses
XBB Mixture No. 1	0.993	Cerebrospinal fluid, dilute urine, secretions and exudates.
XBB Mixture No. 2	1.003	Plasma, serum, transudates, heavy urine, extremely anemic blood, etc.
XBB Mixture No. 3	1.013	
XBB Mixture No. 4	1.023	Anemic blood and heavy secretions.
XBB Mixture No. 5	1.033	
XBB Mixture No. 6	1.043	Normal and anhydremic blood.
XBB Mixture No. 7	1.053	
Standard Potassium Sulfate Solution No. 1		
Standard Potassium Sulfate Solution No. 2		
Standard Potassium Sulfate Solution No. 3		

Accessories:

One vial Heparin with measuring device.

A supply of thread for use in making readings with the falling drop chart.

Two small glass funnels.

One instruction booklet.

Note: A stop watch, calibrated in intervals of 1/10 second is necessary, but is not included in the unit, since many laboratories already have them. We can supply these at additional cost whenever they may be desired.

Price of the LaMotte Falling Drop Densiometer, complete, $65.00, f. o. b., Baltimore, Md.

The LaMotte Research Department, having developed and introduced the LaMotte Densiometer for the present series of tests, is extending their work with this instrument to other fields, to increase its range of usefulness. With the completion of the results of these investigations the data will be printed and distributed to all those interested in the subject.

Continuous research, in connection with this, and other LaMotte equipment, is in keeping with our policy of endeavoring to develop simplified but dependable apparatus to be used by the medical profession in the study of blood and other body fluids.